

IN THE CLAIMS:

The text of all pending claims, (including withdrawn claims) is set forth below. Cancelled and not entered claims are indicated with claim number and status only. The claims as listed below show added text with underlining and deleted text with ~~striketrough~~. The status of each claim is indicated with one of (original), (currently amended), (cancelled), (withdrawn), (new), (previously presented), or (not entered).

Please CANCEL Claim 54.

Please AMEND Claims 38-53 and 55-62, in accordance with the following:

1-37 (CANCELLED)

38. (CURRENTLY AMENDED) A table image processing device comprising:

- a unit inputting an image comprising a sheet image including ruled lines;
- a unit extracting a line by extracting a longitudinal line and a lateral line from the input image;
- a unit finding a potential match of a round corner region by extracting an oblique line which commences from a terminal of a line found by the line extracting unit, and finding a potential match of the round corner region based on the oblique line;
- a unit extracting a cell finding cells containing the potential match of the round corner found by the potential match of the round corner region finding unit; and
- a unit deciding a round corner part ~~deciding~~ decides a round corner based on the cells found by the cell extracting unit;

wherein the unit finding the potential match of the round corner region extracts the oblique element by extracting a first oblique element commencing from a terminal of a longitudinal line, and a second oblique element commencing from a terminal of a lateral line, and

the unit finding the potential match of the round corner region decides, in a case that the first oblique element and the second oblique element overlap, the part as the potential match of the round corner, even when at least one of the first and the second oblique elements are unclear; and

the unit deciding a round corner part decides the part as the round corner in a case that the pixel density at a corner of a cell extracted by the unit extracting the cell changes in a fixed order of low density – high density – low density from outside of the corner area.

39. (CURRENTLY AMENDED) A table image processing device comprising:

a unit inputting an image comprising a sheet image including ruled lines;

a unit extracting a line by extracting a longitudinal line and a lateral line from the input image;

a unit finding a potential match of a round corner region by extracting an oblique line which commences from a terminal of a line found by the line extracting unit, and finding a potential match of the round corner region based on the oblique line;

a unit extracting a cell finding cells containing the potential match of the round corner found by the potential match of the round corner region finding unit; and

a unit deciding a round corner part ~~deciding~~ decides a round corner based on the cells found by the cell extracting unit;

wherein the unit finding the potential match of the round corner region extracts the oblique element by extracting a first oblique element commencing from a terminal of a longitudinal line, and a second oblique element commencing from a terminal of a lateral line, even when at least one of the first and the second oblique elements are unclear; and

wherein ~~(A)~~ the unit finding a potential match of a round corner region decides the part as the potential match of the round corner by two processes of the process (A), (B) and (C) in the following:

(A) process that the part is decides as the potential match of the round corner, in the case that the first oblique element and the second oblique element overlap;

(B) process that the part is decided as the potential match of the round corner, in the case that the distance between the first and the second oblique line found by calculating the distance is within a fixed value; and

(C) the process that the part is decided as the potential match of the round corner in the case that any another oblique element does not exist near an identified oblique element and there is a pattern showing a line feature at the terminal of the identified oblique line; and

wherein the unit deciding a round corner part decides the part as the round corner in the case that the pixel density at a corner of a cell extracted by the unit extracting the cell changes in a fixed order of low density – high density – low density from outside of the corner area.

40. (CURRENTLY AMENDED) A table image processing device comprising:

a unit inputting an image comprising a sheet image including ruled lines;

a unit extracting a line by extracting ~~the~~ a longitudinal line and a lateral line from an input image;

a unit finding a potential match of a round corner region by extracting an oblique line which commences from a terminal of a line found by the line extracting unit, and finding a potential match of the round corner region based on the oblique line;

a unit extracting a cell finding cells containing the potential match of the round corner found by the potential match of the round corner region finding unit; and

a unit deciding a round corner part ~~deciding~~ decides a round corner based on the cells found by the cell extracting unit;

wherein the unit finding the potential match of the round corner region extracts the oblique element by extracting a first oblique element commencing from a terminal of a longitudinal line, and a second oblique element commencing from a terminal of a lateral line, even when at least one of the first and the second oblique elements are unclear; and

wherein ~~(A)~~ the unit finding a potential match of a round corner region decides the part as the potential match of the round corner by the process (A), (B) and (C) in the following:

(A) process that the part is decided as the potential match of the round corner, in a case that the first oblique element and the second oblique element overlap;

(B) process that the part is decided as the potential match of the round corner, in the case that the distance between the first and the second oblique line found by calculating the distance is within a fixed value; and

(C) the process that the part is decided as the potential match of the round corner in the case that any another oblique element does not exist near an identified oblique element and there is a pattern showing a line feature at the terminal of the identified oblique line; and

wherein the unit deciding a round corner part decides the part as the round corner in the case that the pixel density at a corner of a cell extracted by the unit extracting the cell changes in a fixed order of low density – high density – low density from outside of the corner area.

41. (CURRENTLY AMENDED) A~~The~~ table image processing device ~~in~~according to claim 38, wherein the unit deciding a round corner part, after ~~the process of finding~~ the round corner part based on the pixel density change, finds whether the regulation of the ruled line arrangement exists or not, and when the regulation of the ruled line arrangement exists, the unit deciding a round corner part decides another corner of the input image as a round corner.

42. (CURRENTLY AMENDED) A~~The~~ table image processing device ~~in~~according to claim 39, wherein the unit deciding a round corner part, after ~~the process of finding~~ the round corner part based on the pixel density change, finds whether the regulation of the ruled line arrangement exists or not, and when the regulation of the ruled line arrangement exists, the unit deciding a round corner part decides another corner of the input image as a round corner.

43. (CURRENTLY AMENDED) AThe table image processing device ~~in~~according to claim 40₁, wherein the unit deciding a round corner part, after ~~the process of finding the round corner part based on the pixel density change,~~ finds whether the regulation of the ruled line arrangement exists or not, and when the regulation of the ruled line arrangement exists, the unit deciding a round corner part decides another corner of the input image as a round corner.

44. (CURRENTLY AMENDED) AThe table image processing device ~~in~~according to claim 38₁, wherein the unit deciding a round corner₁ in the case that the round corner is not found ~~in the round corner finding process~~ based on the pixel density change, the unit deciding a round corner compares generated patterns ~~made by~~ connecting the terminals of the longitudinal lines or the lateral lines with the round corner part of the input image, and decides the part as the round corner part, when the ~~patterns~~patterns are matched each other.

45. (CURRENTLY AMENDED) AThe table image processing device ~~in~~according to claim 39₁, wherein the unit deciding a round corner, in the case that the round corner is not found ~~in the round corner finding process~~ based on the pixel density change, the unit deciding a round corner compares generated patterns ~~made by~~ connecting the terminals of the longitudinal lines or the lateral lines with the round corner part of the input image, and decides the part as the round corner part, when the ~~patterns~~patterns are matched each other.

46. (CURRENTLY AMENDED) AThe table image processing device ~~in~~according to claim 40₁, wherein the unit deciding a round corner₁ in the case that the round corner is not found ~~in the round corner finding process~~ based on the pixel density change, the unit deciding a round corner compares generated patterns ~~made by~~ connecting the terminals of the longitudinal lines or the lateral lines with the round corner part of the input image, and decides the part as the round corner part, when the ~~patterns~~patterns are matched each other.

47. (CURRENTLY AMENDED) ~~A~~The table image processing device ~~in~~according to claim 40, wherein the unit deciding a round corner part decides the part as the round corner by based on the pixel density~~finding process~~; and

in the case that the round corner is not found in ~~the round corner finding process~~ based on the pixel density change, the unit deciding a round corner part finds whether the regulation of the ruled line arrangement exists or not, and when the regulation exists, decides another corner of the input image as a round corner; and wherein

in the case that the round corner is not found in the round corner finding process based on the pixel density change and the regulation, the unit deciding a round corner compares generated patterns made by connecting the terminals of the longitudinal lines or the lateral lines with the round corner part of the input image, and decides the part as the round corner part, when the patterns are matched each other.

48. (CURRENTLY AMENDED) ~~A~~The table image processing device ~~in~~according to claim 38, wherein the oblique element is decomposed to a longitudinal direction and a lateral direction, and each element is supposed as ruled lines of the longitudinal direction and the lateral direction.

49. (CURRENTLY AMENDED) ~~A~~The table image processing device ~~in~~according to claim 44, wherein the unit deciding a round corner decides, in case that a pattern of nth order function generated between the terminals of lines extracted by the unit extracting line matches the round corner part of the input image, the part as the round corner.

50. (CURRENTLY AMENDED) ~~A~~The table image processing device ~~in~~according to claim 40, further comprising:

a unit finding regions recognizing character finding the character recognition region by neglecting the round corner part decided by the unit deciding round corner in the cells containing the round corner.

51. (CURRENTLY AMENDED) A memory medium storing a program for implementing in a computer a table image processing device, wherein the program comprises:

~~a process~~ inputting an image comprising a sheet image including ruled lines;

~~a process~~ extracting a line by extracting a longitudinal line and a lateral line from the input image;

~~a process~~ finding a potential match of a round corner region by extracting an oblique line which commences from a terminal of a line found by the line extracting process, and finding a potential match of the round corner region based on the oblique line, even when the oblique line is unclear;

~~a process~~ extracting a cell finding cells containing the potential match of the round corner found by the potential match of the round corner region finding process; and

~~a process~~ deciding a round corner part ~~deciding~~ decides a round corner based on the cells found by the cell extracting process;

wherein ~~the process~~ finding the potential match of the round corner region extracts the oblique element by extracting a first oblique element commencing from a terminal of a longitudinal line, and a second oblique element commencing from a terminal of a lateral line, and

~~the process for~~ finding the potential match of the round corner region decides, in a case that the first oblique element and the second oblique element overlap, the part as the potential match of the round corner; and

~~the process for~~ deciding a round corner part decides the part as the round corner in a case that the pixel density at a corner of a cell extracted by the unit extracting the cell changes in a fixed order of low density – high density – low density from outside of the corner area.

52. (CURRENTLY AMENDED) A memory medium storing a program for implementing in a computer a table image processing device, wherein the program ~~comprising~~ comprises:

~~a process~~ extracting a line by extracting a longitudinal line and a lateral line from the input image;

~~a process~~ finding a potential match of a round corner region by extracting an oblique line which commences from a terminal of a line found by the line extracting process, and finding a potential match of the round corner region based on the oblique line, even when the oblique line is unclear;

~~a process~~ extracting a cell finding cells containing the potential match of the round corner found by the potential match of the round corner region finding process; and

~~a process~~ deciding a round corner part ~~deciding~~ decides a round corner based on the cells found by the cell extracting process;

wherein ~~the process~~ finding the potential match of the round corner region extracts the oblique element by extracting a first oblique element commencing from a terminal of a longitudinal line, and a second oblique element commencing from a terminal of a lateral line; and

wherein (A) ~~the process~~ finding a potential match of a round corner region decides the part as the potential match of the round corner by two processes of the process (A), (B) and (C) in the following:

(A) ~~process that the part is decided~~ deciding as the potential match of the round corner, in the case that the first oblique element and the second oblique element overlap;

(B) ~~process that the part is decided~~ deciding as the potential match of the round corner, in the case that the distance between the first and the second oblique line found by calculating the distance is within a fixed value; and

(C) ~~the process that the part is decided~~ deciding as the potential match of the round corner in the case that any another oblique element does not exist near an identified oblique element and there is a pattern showing a line feature at the terminal of the identified oblique line; and

wherein ~~the process~~ deciding a round corner part decides the part as the round corner in the case that the pixel density at a corner of a cell extracted by the unit extracting the cell changes in a fixed order of low density – high density – low density from outside of the corner area.

53. (CURRENTLY AMENDED) A table image processing device comprising:

a unit extracting a line extracting longitudinal lines and lateral lines from an input image;

a unit deciding region recognizing character deciding region recognizing character;

a unit finding a ruled line by using the longitudinal lines and the lateral lines extracted from the unit extracting lines as the potential match of the ruled line and for deciding whether the potential match of the ruled line is a ruled line or not, even when the ruled line is unclear, and

the unit extracting cells based on the result decided by the unit finding ruled line;

wherein the unit finding ruled line finds whether the identified potential match of the ruled line is a ruled line or not based on roughness of the potential match of the ruled line and any one of threshold of different plural thresholds corresponding to another image pattern extracted from the input image pattern existing around the identified potential match of the ruled line, and

the unit finding ruled line comprises at least one unit of a pixel density finding unit (A) and a ruled line width finding unit (B);

the pixel density finding unit (A) finding comprising a first threshold fixed in advance and a second threshold fixed in advance higher than the first threshold, and

the pixel density finding unit, corresponding to the pixel density of the image pattern existing around the identified potential match of the ruled line, uses the first threshold in the case that the pixel density of the image pattern other than the identified potential match of ruled line is high, and uses the second threshold in a case that the pixel density of the image pattern other than the identified potential match of ruled line is low; and wherein:

the ruled line width finding unit (B) comprising the first threshold fixed in advance or the second threshold fixed in advance higher than the first threshold, and

the ruled line width finding unit, corresponding to the width of the image pattern existing around the identified potential match of the ruled line, uses the

first threshold in a case that the width of the image pattern is wide, and uses the second threshold in a case that the width of the image pattern is narrow

when the potential match of the ruled line is a longitudinal line, an image pattern of same length as the potential match of the ruled line existing right and left of the potential match of the ruled line within a fixed range is used as the image pattern existing around the potential match of the ruled line,

when the potential match of the ruled line is a lateral line, an image pattern of same length as the potential match of the ruled line existing up and under of the potential match of the ruled line within a fixed range is used as the image pattern existing around the identified potential match of the ruled line.

54. (CANCELLED)

55. (CURRENTLY AMENDED) The table image processing device ~~in~~according to claim 53, wherein the ruled line width finding unit uses the potential match of the ruled line extending to same direction as the identified potential match of ruled line and adjacent or connected to the identified potential match of ruled line as the image pattern existing around the identified potential match of ruled line.

56. (CURRENTLY AMENDED) The table image processing device ~~in~~according to claim 53, wherein the ruled line width finding unit decides that the width of the potential match of the ruled line is wide in the case that the width of potential match of ruled line is grater than the n times of the width of the image pattern existing around the identified potential match of ruled line, and the width of the potential match of the ruled line is narrow in a case that the width of potential match of ruled line is less than the $1/n$ times of the width of the image pattern existing around the identified potential match of ruled line.

57. (CURRENTLY AMENDED) A table image processing device comprising:

a unit extracting a line extracting longitudinal lines and lateral lines from an input image;

a unit deciding region recognizing character deciding region recognizing character;

a unit finding a ruled line by using the longitudinal lines and the lateral lines extracted from the unit extracting lines as the potential match of the ruled line and for deciding whether the potential match of the ruled line is a ruled line or not, even when the ruled line is unclear, and

the unit extracting cells based on the result decided by the unit finding ruled line;

wherein the unit finding the ruled line finds whether the identified potential match of the ruled line is a ruled line or not based on roughness of the potential match of the ruled line and any one of threshold of different plural thresholds corresponding to another image pattern extracted from the input image pattern existing around the identified potential match of the ruled line, and

the unit finding ruled line comprises a pixel density finding unit (A) and a ruled line width finding unit (B);

the pixel density finding unit (A) finding comprising a first threshold fixed in advance and a second threshold fixed in advance higher than the first threshold, and

the pixel density finding unit, corresponding to the pixel density of the image pattern existing around the identified potential match of the ruled line, uses the first threshold in a case that the pixel density of the image pattern other than the identified potential match of ruled line is high, and uses the second threshold in a case that the pixel density of the image pattern other than the identified potential match of ruled line is low; and wherein

the ruled line width finding unit (B) comprising the first threshold fixed in advance or the second threshold fixed in advance higher than the first threshold, and

the ruled line width finding unit, corresponding to the width of the image pattern existing around the identified potential match of the ruled line, uses the

first threshold in a case that the width of the image pattern is wide, and uses the second threshold in a case that the width of the image pattern is narrow.

58. (CURRENTLY AMENDED) The table image processing device ~~in~~according to claim 57 further comprising: a unit finding the potential match of the round corner region and a unit deciding a round corner part,

wherein the unit finding the potential match of the round corner region extracts the oblique element by extracting a first oblique element commencing from a terminal of a longitudinal line, and a second oblique element commencing from a terminal of a lateral line, and

the unit finding the potential match of the round corner region decides, in a case that the first oblique element and the second oblique element overlap, the part as the potential match of the round corner; and

the unit deciding a round corner part decides the part as the round corner in a case that the pixel density at a corner of a cell extracted by the unit extracting the cell changes in a fixed order of low density – high density – low density from outside of the corner area.

59. (CURRENTLY AMENDED) A memory medium storing program for implementing in a computer of a table image processing device, the program comprising:

~~a process~~ deciding region recognizing character deciding region recognizing character;

~~a process~~ finding a ruled line by using the longitudinal lines and the lateral lines extracted from a unit extracting lines as the potential match of the ruled line and for deciding whether the potential match of the ruled line is a ruled line or not, even when the ruled line is unclear, and

~~a process~~ extracting cells based on the result decided by the process finding a ruled line;

wherein ~~the process~~ finding the ruled line finds whether the identified potential match of the ruled line is a ruled line or not based on roughness of the potential match of the ruled line and any one of threshold of different plural

thresholds corresponding to another image pattern extracted from the input image pattern existing around the identified potential match of the ruled line, and

~~the process~~ finding ruled line comprises at least one unit of a pixel density finding process (A) and a ruled line width finding process (B);

the pixel density finding process (A) finding comprising a first threshold fixed in advance and a second threshold fixed in advance higher than the first threshold, and

the pixel density finding process, corresponding to the pixel density of the image pattern existing around the identified potential match of the ruled line, uses the first threshold in a case that the pixel density of the image pattern other than the identified potential match of ruled line is high, and uses the second threshold in the case that the pixel density of the image pattern other than the identified potential match of ruled line is low; and wherein

the ruled line width finding process (B) comprising the first threshold fixed in advance or the second threshold fixed in advance higher than the first threshold, and

the ruled line width finding process, corresponding to the width of the image pattern existing around the identified potential match of the ruled line, uses the first threshold in a case that the width of the image pattern is wide, and uses the second threshold in a case that the width of the image pattern is narrow.

60. (CURRENTLY AMENDED) ~~A~~The memory medium storing program for implementing in a computer of a table image processing device ~~in~~according to claim 59, further comprising: ~~a process for finding the potential match of the round corner region and a process for deciding a round corner part,~~

wherein ~~the process~~ finding the potential match of the round corner region extracts the oblique element by extracting a first oblique element commencing from a terminal of a longitudinal line, and a second oblique element commencing from a terminal of a lateral line, and

~~the process~~ finding the potential match of the round corner region decides, in the case that the first oblique element and the second oblique element overlap, the part as the potential match of the round corner; and

~~the process~~ deciding a round corner part decides the part as the round corner in a case that the pixel density at a corner of a cell extracted by the unit extracting the cell changes in a fixed order of low density – high density – low density from outside of the corner area.

61. (CURRENTLY AMENDED) A table image processing method comprising:

~~a process~~ extracting a line extracting longitudinal lines and lateral lines from an input image;

~~a process~~ deciding region recognizing character deciding region recognizing character;

~~a process~~ finding a ruled line by using the longitudinal lines and the lateral lines extracted ~~from the unit extracting lines~~ as the potential match of the ruled line and for deciding whether the potential match of the ruled line is a ruled line or not, even when the ruled line is unclear, and

~~the process~~ extracting cells based on the result of ~~decided by the process~~ for finding the ruled line;

wherein ~~the process~~ during the finding of the ruled line ~~finds it is determined~~ whether the identified potential match of the ruled line is a ruled line or not based on roughness of the potential match of the ruled line and any one of threshold of different plural thresholds corresponding to another image pattern extracted from the input image pattern existing around the identified potential match of the ruled line, and

~~the process~~ finding ruled line comprises finding at least one unit of a pixel density ~~finding process~~ (A) and finding a ruled line width ~~finding process~~ (B);

wherein, finding the at least one unit of a pixel density ~~finding process~~ (A) ~~finding comprising~~ comprises a first threshold fixed in advance, and a second threshold fixed in advance higher than the first threshold, and

~~finding the at least one unit of a pixel density finding process,~~
corresponding to the pixel density of the image pattern existing around the identified potential match of the ruled line, uses the first threshold in the case that the pixel density of the image pattern other than the identified potential match of ruled line is high, and uses the second threshold in a case that the pixel density of the image pattern other than the identified potential match of ruled line is low; and wherein

~~finding the ruled line width finding process~~ (B) ~~comprising~~ comprises the first threshold fixed in advance or the second threshold fixed in advance higher than the first threshold, and

~~finding the ruled line width finding process,~~ corresponding to the width of the image pattern existing around the identified potential match of the ruled line, uses the first threshold in a case that the width of the image pattern is wide, and uses the second threshold in a case that the width of the image pattern is narrow.

62. (CURRENTLY AMENDED) The table image processing method ~~in~~according to claim 61 further comprising:

~~a process~~ finding a potential match of a round corner region by extracting an oblique line which commences from a terminal of a line found by the line extracting process, and finding a potential match of the round corner region based on the oblique line;

~~a process~~ extracting a cell finding cells containing the potential match of the round corner found by the potential match of the round corner region finding ~~process~~unit; and

~~a process~~ deciding a round corner part ~~deciding a round corner~~ based on the cells found by the cell extracting ~~process~~unit;

wherein ~~the process~~ finding the potential match of the round corner region extracts the oblique element by extracting a first oblique element commencing from a terminal of a longitudinal line, and a second oblique element commencing from a terminal of a lateral line, and

~~the process~~ finding the potential match of the round corner region decides, in a case that the first oblique element and the second oblique element overlap, the part as the potential match of the round corner; and

~~the process~~ deciding a round corner part decides the part as the round corner in a case that the pixel density at a corner of a cell extracted by the process extracting the cell changes in a fixed order of low density – high density – low density from outside of the corner area.